SCIENCE

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Prof. J. McKeen Cattell, Garrison-on-Hudson, N. Y.

*THE RELATIONS OF SCIENCE AND THE SCIENTIFIC CITIZEN TO THE GENERAL GOVERNMENT.**

IN the founding of states, and in the early stages of that development of local and general government that rests on new principles or on novel combinations of well recognized theories, the stress of individual and collective effort for simple existence is the dominant factor in the community. Under such circumstances the systematic investigation of natural phenomena can have no place in the occupations of men, nor receive recognition in those fundamental laws that set forth the rights and the duties of the citizen and the powers of the state.

Republics are born of the impelling desire for the greatest good for the maximum number of citizens, and that democratic impulse reaches its highest activity only when community of interest and comparative equality of estate and station characterize the members of the body politic. With the material development of states the varied energies and capacities of individuals soon introduce aspirations for higher knowledge and also those combinations for wielding financial power which are inseparable from all highly organized communities; and such forces, in their turn, demand not only the practical application

* Read before the Philosophical Society of Washington, D. C., February 6, 1897.

of scientific methods in every direction, but they are satisfied with nothing less than the latest and best results of scientific investigation.

While this is generally true of the evolution of all states and nations, it is especially characteristic of the progress of our own Republic.

During the existence of the English-speaking colonies in what is now known as the United States of America, the independence of the various colonial governments, the slow and uncertain means of communication, and the general lack of wealth throughout the land, not only furnished no stimulus to scientific activity, but presented effectual barriers against all continuous devotion to scientific investigation. Up to the time of the War of the Revolution the schools and colleges of the colonies would have been held guiltless of wasting any time on the natural sciences. At that time, also, there was no attempt in any of the seats of learning to teach anything but a smattering of mathematics and the physical sciences.

In 1787 science was not recognized by the individual or by ethical, social, educational or political organizations as a prominent factor in intellectual or material progress. In the old and wealthy states of Europe the pursuit of mathematical studies had opened the way for the development of the physical sciences; but on this continent the study of algebra, the basis of mathematical analysis, had not acquired a respectable standing in even the best colleges, while in most of the educational institutions of the land the subject was entirely neglected, if not unknown. For that reason alone, the physical sciences could have no place or influence in the thoughts of the people who formed our Federal Constitution.

Without recognition in the organization of the general government, science was left to fight its way along its own lines; struggling at first to reach practical results rather than fundamental laws; sometimes failing and often uncertain in its aims, but still untrammeled by the fetters of bureaucratic domination.

The State, Treasury, War, Postoffice and Law Departments of the general government were organized in 1789; the Navy Department in 1793, the Interior in 1849 and the Department of Agriculture in 1889. The real or fancied needs of a government devised to promptly respond to the widely divergent interests and activities of an energetic people soon made it necessary to have under its own control some of the means for producing results by the best known scientific methods.

In a halting and half-hearted way a number of attempts were made to lay the foundations of scientific attachments to some of the executive departments. These centers of scientific activity were set in motion by widely different influences, though all were united apparently in seeking immediate and practical accessions to the material welfare of the country.

When considerable progress had been made in the installation of these new ventures it was found that the men of scientific training, the only proper personnel for such work, were not to be found in this country, and the development of the scientific worker, under more or less incompetent direction, was the first obstacle to be overcome. With that remarkable adaptability and energy which has characterized the American mind in its struggle with the forces of nature during the last century, the men for prosecuting the work of these new establishments were found and were mostly trained in this country.

That the best plans and the most efficient methods were not always adopted was to be expected, but it may be truthfully said that in the short space of fifty years the generosity of our general government so fully met the demands of the people for

scientific work and investigation that the cost of buildings and apparatus, together with the apparent propects for immediate and valuable results, compels a not unfavorable comparison with the progress of two centuries in the older and more wealthy countries of Europe.

That these achievements were not all real or highly satisfactory was not altogether the fault of the scientific men who zealously labored in the good cause. Under a monarchical or paternal form of government the nominal head possesses the power and assumes the responsibility. The heads of departments and the directors of public works are given certain powers and are held to a rigid accountability. An *ideal* republic might enjoy similar advantages, but a republic *in esse* is not always so fortunate.

Theoretically, all citizens of a republic owe their government equal and faithful service; but actual equality of individuals under any form of government, save in regard to the right to protection of person and property under the law, is a myth, a weak survival of the time when popular sentiment misquoted reason in the arena of practical politics. Out of this erroneous theory, however, has grown in our Republic a somewhat hazy and ill-defined feeling that any citizen is competent as an executive, an administrator, a legislator, a jurist or a director of scientific investigation.

This nebulous but popular belief in the varied aptitude of our citizens has in many instances resulted in serious damage to some of those centers of scientific work which come under the control of the Government.

For many years the political theory that 'to the victors belong the spoils' cast its baneful influence over the scientific as well as the business branches of the executive departments, and social and bureaucratic, leagued with political, influences left few positions for the unfortunate men of science who were forced to rely on the power of their own accomplishments.

Another and by no means a minor factor in the relations of science and the Government is a popular notion of the status of the scientific investigator in society in this country. From one standpoint he is regarded as a human prodigy, gifted beyond his fellows, able to fathom all the subtle mysteries of nature; one by whom all moral and social as well as physical problems are readily solved with more than ordinary human certainty. On the other hand, when the practical politician, or some other fortunate man born to direct affairs, assumes the direction of a branch of the government service he looks upon the scientific man as a more or less harmless eccentric, a feeble specimen of manhood, but, unfortunately, sometimes necessary to the existence of his bureau. Pity for his assumed helplessness is mingled with crude flattery in such proportions as are deemed expedient to secure the necessary professional work, while at the same time the unhappy man of science is assured that he is peculiarly fortunate in having the guidance and protection of a man of affairs who knows the ways of the world.

It is hardly necessary to say that, as a matter of fact, both these extreme views of the scientific man are usually wrong. In general he differs from his fellows only in the possession of some peculiar aptitude or talent for study or investigation in some department of science. He may be a good chemist, and shirk every duty of a good citizen; a learned mathematician, with manners and tastes that bear no trace of gentle breeding or moral training; a gifted biologist, but with a selfish greed that puts him out of touch with the best citizens, the wisest government or the true unselfish seeker after truth in any sphere of human endeavor; in short, the manifestation of ability in scientific pursuits, as in other

walks in life, does not necessarily imply the possession of good morals or the other qualities that make the good citizen. The true scientific man *ought* to be the highest type of moral and patriotic development, since, above all other men, he should fully recognize the unfailing logical relation of cause and effect.

The sooner he is freed from the injustice of absurd flattery on the one hand and ignorance and vicious criticism on the other, and is permitted or obliged to stand on his own merit as a citizen and as a scientific worker and investigator, the better it will be for science and for our country.

Again, the real scientific man has no more need of a business manager than has a lawyer, a doctor or any other professional man. From observation and from experience gathered in the service of the Government for a third of century, I am convinced that the genuine scientific men in the Executive Departments and throughout the country have as much executive and administrative ability as any other class of citizens in the land.

The nature of their interests and pursuits tends to make them less demonstrative than most other men, and in their own ranks those who make the most display and noise in the public press and otherwise are generally least effective as investigators or as directors of real work.

Organized as most of our Government scientific bureaus are, subject to a change in the controlling force, at least every four years, it would be strange, indeed, if the individual members, from their almost constant contact with the practical politician, did not unconsciously acquire some of the habits of thought and action of those who have learned to so manipulate the primaries that the final outcome of an apparently free election shall result in purely personal rather than public advantage.

That some scientific men have not entirely avoided this contagion may be inferred if one studies the methods sometimes employed to obtain the influence that recommends candidates for important positions and that frequently controls such appointments.

The usual remark in such cases that, "after all, scientific men are only human," is not sufficient excuse for any man whose first duty is to be a good citizen.

In Washington one frequently hears the complaint that the scientific man does not receive that respectful consideration from the Government which he really deserves. One also hears in this connection an uncomplimentary comparison between the honors bestowed upon scientific men under our republican Government and those conferred upon their fellows by the imperial rulers of foreign nations. That there is some truth in these views may not be wholly denied, but it should be remembered that, to a great extent, in this country, as in all others, the scientific men have this matter under their own control.

Many times in every year the executive and administrative officers of our Government find it necessary to ask for the opinions and counsel of scientific men. Frequently these same men feel moved to offer their views and advice to the Government, and on all such occasions they have ample opportunity to exhibit whatever unselfish, self-respecting and patriotic characteristics they may possess. If, however, the representatives of the Government find that a body of scientific men have urged the appointment, to a position of trust and responsibility, of one whom they must have known, if they knew the man, was morally and mentally unfit for the place; or if they put in train a scheme for their personal aggrandizement or professional profit, then they have plainly cheapened their own influence and damaged the reputation of all scientific men in the country in the opinion of the

Government officials; and they have no right to complain of lack of appreciation by men whom they have once deceived. Those who would win the respect of others must first respect themselves.

The widely scattered condition of the scientific bureaus of the Government in Washington is sufficient in itself to prevent a normal development of those interests in which the whole country is concerned, and for which important legislation and large appropriations have been urgently invoked

If the opponents of scientific work under the control of the general government had sought for a system that should produce generally the least valuable results for the money and energy expended, it would be difficult to see how they could have devised a plan better suited to their purposes than the one which has existed in Washington for many years.

Until the organization of the Department of Agriculture no change had been made, since the foundation of the Republic, in the custom of founding scientific bureaus or divisions in the various departments, like mission churches on the extreme frontier, with scant visible means of support, and no active, intelligent or discriminating official interest as an effective, sustaining power in the inevitable struggle with adverse legislation and ill-considered, semi-official criticism.

In the fiscal year of 1895–6 Congress appropriated in round numbers $4,500,000 for such scientific work as requires special and technical training in those who carry out the details, and a high degree of scientific knowledge and skill in those who actually plan and superintend the work and finally prepare and present the results to the public.

This amount is very unequally divided between the Treasury, War, Navy, Interior, Agriculture and Labor Departments, and amounts, in the aggregate, to about *one per cent.* of all the money appropriated for these several departments. Considering the total appropriations for each department it is found that scientific work is accorded in the Treasury Department about *one-half of one per cent.*; in the War Department *six-hundredths* of one per cent.; in the Navy Department *seventy-six* hundredths of one per cent.; in the Interior Department *one* per cent., and in the Agricultural Department *fifty-three* per cent.

It should be noted that the Department of Agriculture was organized for a special purpose—to treat the vast interests of agriculture in a technical and scientific manner; and it is the only executive department of the Government whose principal interests and energies are fostered and guided by the methods and the results of modern science.

The highly important duties of a national character which require the daily attention of the heads of the large executive departments naturally occupy all the time at their disposal and absorb their active interest.

Under such conditions it is not likely that the quiet and undemonstrative scientific bureaus can receive the intelligent care and sympathy necessary to their proper development. It can not be said truthfully that this lack of support is due to any fault of the various Secretaries.

It is due primarily to the inherent weakness of a system which, if it ever worked well, in the present crowded and complicated work of the larger departments, now leaves the various scientific bureaus to shift for themselves and permits them to be driven out of the field of consideration in competition with the imperative and legitimate work of such departments.

It is not likely that this unfortunate condition of the scattered scientific bureaus will improve under the present conditions.

This peculiar situation has been a source of considerable anxiety in the minds of many scientific men for the last fifteen

years, and it has not escaped the notice of several thoughtful members of both branches of the national legislature. On January 5, 1888, the Hon. R. W. Townsend, of Illinois, introduced in the House of Representatives a bill 'To establish a Department of Industries and Public Works,' under which should be collected all those bureaus and divisions of scientific work under the control of the general Government, except such as were essential to the distinctive duties of the several existing executive departments.

The author of this bill intended to improve and strengthen all these centers of investigation by bringing them under one executive head, whose sole business would be to protect their rights, provide for their support and represent them with authority before Congress and in the executive councils.

Unfortunately for the scientific interests involved, Mr. Townsend died before his proposition could be considered in the committee to which it was referred; and no comprehensive plan of that nature has since been considered by Congress. The general scheme formulated by Mr. Townsend was approved by scientific men throughout the country, as well as by those in the Government service in Washington, and it has not been abandoned.

It should be said, however, that it has not received the *universal* assent of scientific men either here or in other parts of the country. The scientific man is sometimes swayed by the same motives that influence other people.

If his field of view is limited by the narrow bounds of his own specialty; if he feels certain of getting all he wants for his own particular investigation, or that the present chief of his department is generous to him personally; if he feels that it is more agreeable to rule his small office absolutely while nominally under the control of an easy-going but untrained chief, rather than to help forward the whole cause of scientific investigation; or, if he feels that lack of intelligent supervision enables him to manipulate the affairs of his office for his own immediate, personal reputation, aggrandizement or pecuniary profit; he is likely to prefer the present system rather than one that aims to so arrange and adjust all the scientific bureaus of the Government in such a way that their mutual relations shall be harmonious, and their several interests continually advanced under economical and thorough methods, but without friction or duplication of work.

It is not the object of this communication to point out the selfishness or incompetence of individuals or the shortcomings of bureaus or departments, but to call anew the attention of the members of this society to their relations to the general Government either as citizens or as scientific investigators.

It should never be forgotten that our Government as represented by the Executive, Legislative and Judical powers is simply the agent of the people, not *some* of the people, but *all* of the people, and that they are entitled to the best service to be found within the borders of our broad domain.

To that end it follows that personal claims, clamor of cliques, and the greed and selfishness of those who seek to hold or gain official position, should have little or no weight in the proper organization and control of the scientific work of the Government, where professional merit and adaptibility alone should guide the selection of the personnel, and where practical and theoretical results and investigations, in their proper mutual relations, and controlled by wise economy, should be the single aim of the Government.

It may be exceedingly difficult to fix the time when this desirable consummation shall be affected; but to all scientific work-

ers, both in and out of the public service, who really believe that there has been notable progress along the lines of scientific investigation in this country since 1789, it presents a common goal towards which all may strive; a higher ideal of the relations of science and the government, and a more patriotic conception of the true relations between the intelligent citizen and the government in a genuine republic.

J. R. EASTMAN.

WASHINGTON, D. C.

THE NEW YORK STATE SCIENCE TEACHERS' ASSOCIATION.

III.

THURSDAY, December 31st, two sessions were held in the new Medical College of Syracuse University. The morning meeting was devoted to Biology. Professor C. W. Dodge, of the University of Rochester, read a paper on 'Biological Work in the High School.'* He was followed by Dr. Thomas B. Stowell, of the Potsdam Normal School, with a paper entitled:

The Educative Value of the Study of Biology.

MR. PRESIDENT: Memory of the many days that we have labored together in the Biological Laboratory gives me greater boldness to continue this discussion, for I shall rely upon you, sir, to supply whatever may be lacking in my argument to make sure defense of the cause which I gladly espouse.

I shall outline my idea of the educative value of the biological studies from two standpoints: their value by virtue of the psychology of the study; and second, because of the demands of practical life. And I shall venture to concrete my conclusion by suggesting methods and measures to make this scheme effective and operative.

*At the request of the Association, Professor Dodge repeated this paper, which he prepared last spring for the University Convocation of the State of New York. It is printed in Regents' Bulletin, No. 36, September, 1896, pp. 46–62.

Two problems confront us at the threshold of practical life: the ever present 'bread and butter' problem, type of all utilitarian questions; and processes or procedures to effect desired ends, *i. e.*, the multiple forms of ethical questions whose solution depends primarily upon taste, for I take it that men differ little in conclusions from demonstrable or even from probable premises, which are intellections; the radical difference in men is in taste, or in the emotions which prompt to specific action.

The final cause of study is both cultural and utilitarian; forces or agencies which afford increased facility in developing and in directing the energies or the activities of soul are termed cultural; the results of these forces, that which discovers what is utilized or may be used in every-day life, that which conduces to personal comfort and pleasure, and that which fosters the discovery of such forces and ends are practical, utilitarian.

I shall not contend for the ultilitarian value of the nature studies, for their contribution to temporal comfort, to happiness, to longevity and to prosperity is generally conceded.

The discussion is restricted to the cultural value of such studies. To fit men for life in a broad sense demands such soul-furnishing as will insure correctness in judgment; acquisition of such habits as will guarantee prompt action; and assurance of conduct conformable with the high standards espoused. If I err not, a critical examination of the school curriculum will disclose the fact that its final cause is intellectual acumen rather than moral power; in other words, intellectual activity rather than emotional is the purpose of the schools. I do not decry the schools of to-day; I do not advocate lowered standards, but I urge most persistently the need of culture of the emotional life which is the spring, the source of conduct. Modern psychology has happily